Course Unit Title	**AMEE 304 Heat Transfer**
Programme of study	BSc in Mechanical Engineering
Lecturer	Dr.-Ing. Paris A. Fokaides
Type of course unit	Compulsory
ECTS	5
Year of study:	3
Semester(s) offered	Fall Semester 2019
Course content	▪ Basics of Heat Transfer ▪ Steady state and transient Heat Conduction ▪ Free and forced Heat Convection ▪ Thermal Radiation ▪ Boiling and Condensation ▪ Mass Transfer
Course modules:	**1. Introduction – Basics of Heat Transfer** ▪ Heat transfer applications ▪ Heat transfer mechanisms ▪ Problem solving techniques **2. Fundamentals of Heat Conduction** ▪ Steady versus transient heat transfer ▪ Multidimensional heat transfer ▪ Heat generation ▪ One dimensional heat conduction equation **3. Steady Heat Conduction** ▪ Steady heat conduction in plane walls ▪ The thermal resistance concept ▪ Heat conduction in cylinders and spheres ▪ Heat transfer between two solids (Shape factor) **4. Transient Heat Conduction** ▪ Lumped system analysis ▪ Transient heat conduction with spatial effect ▪ Transient heat transfer in multi-dimensional systems **5. Fundamentals of Heat Convection** ▪ Physical mechanisms of convection ▪ Classification of fluid flows ▪ Velocity and thermal boundary layer ▪ Laminar and turbulent flows **6. Forced Convection** ▪ Parallel flow over flat plates ▪ Flow across cylinders and spheres ▪ Laminar flows in tubes ▪ Turbulent flows in tubes **7. Natural Convection** ▪ Physical mechanism of natural convection ▪ Equation of motion ▪ Natural convection over surfaces ▪ Natural convection inside enclosures ▪ Combined natural and forced convection **8. Fundamentals of Thermal Radiation** ▪ The view factor

	▪ Radiation heat transfer: black surfaces ▪ Radiation heat transfer: diffuse and gray surfaces ▪ Radiation shields ▪ Emissivity and absorptivity of gases **9. Boiling and Condensation** ▪ Boiling heat transfer ▪ Condensation heat transfer **10. Mass Transfer Principles** ▪ Analogy between heat and mass transfer ▪ Fick's law of diffusion ▪ Boundary conditions ▪ Steady mass diffusion through a wall ▪ Water vapor migration in buildings **11. Transient Mass Transfer** ▪ Transient mass diffusion ▪ Diffusion in a moving medium ▪ Mass convection ▪ Simultaneous heat and mass transfer **Laboratory Exercises:** 1. Determination of the Specific Heat Capacity 2. Determining the thermal conductivity of materials using the single-plate and flux plate methods 3. Forced convection over flat plates, plates with fins and plates with rods 4. Free convection over flat plates, plates with fins and plates with rods 5. Thermal Radiation System 6. Radiation intensity and thermoelectric Converter
Textbooks:	Cengel, Y. A., & Ghajar, A. J. (2011). Heat and mass transfer (a practical approach, SI version). McGraw-Hill Education
Instruction language	English
External Reference	link